APPENDIX G

Text of All Management Measures

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Text of All Management Measures[1]

Agriculture

A. Erosion and Sediment Control Management Measure

Apply any combination of conservation practices and management that achieves an acceptable level of treatment to minimize the delivery of sediment from agricultural lands to surface waters, or

Design and install a combination of management and physical practices to settle the settleable solids and associated pollutants in runoff delivered from the contributing area for storms of up to and including a 10-year, 24-hour frequency.

B. Management Measure for Wastewater and Runoff from Confined Animal Facility

Limit the discharge from the confined animal facility to surface waters by:

(1) Containing both the wastewater and the contaminated runoff from confined animal facilities that is caused by storms up to and including a 25-year, 24-hour frequency storm event. Storage structures should be of adequate capacity to allow for proper wastewater utilization and constructed so they prevent seepage to groundwater; and
(2) Managing stored contaminated runoff and accumulated solids from the facility through an appropriate waste utilization system.

C. Nutrient Management Measure

Develop, implement, and periodically update a nutrient management plan to: (1) apply nutrients at rates necessary to achieve realistic crop yields, (2) improve the timing of nutrient application, and (3) use agronomic crop production technology to increase nutrient use efficiency. When the source of the nutrients is other than commercial fertilizer, determine the nutrient value. Determine and credit the nitrogen contribution of any legume crop. Soil and/or plant tissue testing should be used at a suitable interval. Nutrient management plans contain the following core components:

(1) Farm and field maps showing acreage, crops, soils, and waterbodies.
(2) Realistic yield expectations for the crop(s) to be grown, based on achievable yields for the crop. Individual producer constraints and other producer's yields would be considered in determining achievable yields.
(3) A summary of the soil condition and nutrient resources available to the producer, which at a minimum would include:
    - An appropriate mix of soil (pH, P, K) and/or plant tissue testing or historic yield response data for the particular crop;

1Excerpted from *Hawaii's Coastal Nonpoint Pollution Control Program Management Plan*, Section III

- Nutrient analysis of manure, sludge, mortality compost (birds, pigs, etc.), or effluent (if applicable);
- Nitrogen contribution to the soil from legumes grown in the rotation (if applicable); and
- Other significant nutrient sources (e.g., irrigation water).

(4) An evaluation of field limitations based on environmental hazards or concerns, such as:

- Lava tubes, shallow soils over fractured bedrock, and soils with high leaching or runoff potential,
- Distance to surface water,
- Highly erodible soils, and
- Shallow aquifers.

(5) Best available information is used in developing recommendations for the appropriate mix of nutrient sources and requirements for the crops.

(6) Identification of timing and application methods for nutrients to: provide nutrients at rates necessary to achieve realistic crop yields; reduce losses to the environment; and avoid applications as much as possible during periods of leaching or runoff.

(7) Methods and practices used to prevent soil erosion or sediment loss.

(8) Provisions for the proper calibration and operation of nutrient application equipment.

D. Pesticide Management Measure

To eliminate the unnecessary release of pesticides into the environment and to reduce contamination of surface water and ground water from pesticides:

(1) Use integrated pest management strategies where available that minimize chemical uses for pest control.

(2) Manage pesticides efficiently by:

(a) calibrating equipment;
(b) using appropriate pesticides for given situation and environment;
(c) using alternative methods of pest control; and
(d) minimizing the movement of pest control agents from target area.

(3) Use anti-backflow devices on hoses used for filling tank mixtures.

(4) Enhance degradation or retention by increasing organic matter content in the soil or manipulating soil pH.

E. Grazing Management Measure

Protect range, pasture, and other grazing lands:

(1) By implementing one or more of the following to protect sensitive areas (such as streambanks, wetlands, estuaries, ponds, lake shores, near coastal waters/shorelines, and riparian zones):

(a) Exclude livestock,
(b) Provide stream crossings or hardened watering access for drinking,
(c) Provide alternative drinking water locations,

(d) Locate salt and additional shade, if needed, away from sensitive areas, or

(e) Use improved grazing management (e.g., herding) to reduce the physical disturbance and reduce direct loading of animal waste and sediment caused by livestock; and

(2) By achieving either of the following on all range, pasture, and other grazing lands:

(a) Implement range and pasture conservation and management practices that achieve an acceptable level of treatment to reduce erosion, or

(b) Maintain range, pasture, and other grazing lands in accordance with activity plans established by the Division of Land Management of DLNR, federal agencies managing grazing land, or other designated land management agencies.

F. Irrigation Water Management Measure

To reduce nonpoint source pollution of surface waters caused by irrigation:

(1) Operate the irrigation system so that the timing and amount of irrigation water applied match crop water needs. This will require, as a minimum:
(a) the measurement of soil-water depletion volume and the volume of irrigation water applied;
(b) uniform application of water; and
(c) application rate which does not exceed infiltration rate in the field.

(2) When chemigation is used, include backflow preventers for wells, minimize the harmful amounts of chemigated waters that discharge from the edge of the field, and control deep percolation. In cases where chemigation is performed with furrow irrigation systems, a tailwater management system may be needed.

The following limitations and special conditions apply:

(1) In some locations, irrigation return flows are subject to other water rights or are required to maintain stream flow. In these special cases, on-site reuse could be precluded and would not be considered part of the management measure for such locations.

(2) By increasing the water use efficiency, the discharge volume from the system will usually be reduced. While the total pollutant load may be reduced somewhat, there is the potential for an increase in the concentration of pollutants in the discharge. In these special cases, where living resources or human health may be adversely affected and where other management measures (nutrients and pesticides) do not reduce concentrations in the discharge, increasing water use efficiency would not be considered part of the management measure.

(3) The time interval between the order for and the delivery of irrigation water to the farm may limit the irrigator's ability to achieve the maximum on-farm application efficiencies that are otherwise possible.

(4) In some locations, leaching is necessary to control salt in the soil profile. Leaching for salt control should be limited to the leaching requirement for the root zone.

(5) Where leakage from delivery systems or return flows supports wetlands or wildlife refuges, it may be preferable to modify the system to achieve a high level of efficiency and then divert the "saved water" to the wetland or wildlife refuge. This will improve the quality of water delivered to wetlands or wildlife refuges by preventing the introduction of pollutants from irrigated lands to such diverted water.

(6) In some locations, sprinkler irrigation is used for crop cooling or other benefits (e.g., watercress). In these special cases, applications should be limited to the amount necessary for crop protection, and applied water should not contribute to erosion or pollution.

Forestry

A. Preharvest Planning Management Measure

Perform advance planning for forest harvesting that includes the following elements, where appropriate:

(1) Identify the area to be harvested including location of waterbodies and sensitive areas such as wetlands, threatened or endangered aquatic species habitats, or high erosion-hazard areas (landslide-prone areas) within the harvest unit.

(2) Time the activity for the season or moisture conditions when the least impact occurs.

(3) Consider potential water quality impacts and erosion and sedimentation control in the selection of silvicultural and regeneration systems, especially for harvesting and site preparation.

(4) Reduce the risk of occurrence of landslides and severe erosion by identifying high erosion-hazard areas and avoiding harvesting in such areas, to the extent practicable.

(5) Consider additional contributions from harvesting or roads to any known existing water quality impairments or problems in watersheds of concern.

Perform advance planning for forest road systems that includes the following elements, where appropriate:

(1) Locate and design road systems to minimize, to the extent practicable, potential sediment generation and delivery to surface waters. Key components are:

- locate roads, landings, and skid trails to avoid, to the extent practicable, steep grades and steep hillslope areas, and to decrease the number of stream crossings;
- avoid, to the extent practicable, locating new roads and landings in Streamside Management Zones (SMZs); and
- determine road usage and select the appropriate road standard.

(2) Locate and design temporary and permanent stream crossings to prevent failure and control impacts from the road system. Key components are:
- size and site crossing structures to prevent failure;
- for fish-bearing streams, design crossings to facilitate fish passage.

(3) Ensure that the design of road prism and the road surface drainage are appropriate to the terrain and that road surface design is consistent with the road drainage structures.

(4) Use suitable materials to surface roads planned for all-weather use to support truck traffic.

(5) Design road systems to avoid high erosion or landslide hazard areas. Identify these areas and consult a qualified specialist for design of any roads that must be constructed through these areas.

Each State should develop a process (or utilize an existing process) that ensures that the management measures in this chapter are implemented. Such a process should include appropriate notification, compliance audits, or other mechanisms for forestry activities with the potential for significant adverse nonpoint source effects based on the type and size of operation and the presence of stream crossings or SMZs.

B. Streamside Management Zones (SMZs)

Establish and maintain a streamside management zone along surface waters, which is sufficiently wide and which includes a sufficient number of canopy species to buffer against detrimental changes in the temperature regime of the waterbody, to provide bank stability, and to withstand wind damage. Manage the SMZ in such a way as to protect against soil disturbance in the SMZ and delivery to the stream of sediments and nutrients generated by forestry activities, including harvesting. Manage the SMZ canopy species to provide a sustainable source of large woody debris needed for instream channel structure and aquatic species habitat.

C. Road Construction/Reconstruction Management Measure

(1) Follow preharvest planning (as described under Management Measure A) when constructing or reconstructing the roadway.

(2) Follow designs planned under Management Measure A for road surfacing and shaping.

(3) Install road drainage structures according to designs planned under Management Measure A and regional storm return period and installation specifications. Match these drainage structures with terrain features and with road surface and prism designs.

(4) Guard against the production of sediment when installing stream crossings.

(5) Protect surface waters from slash and debris material from roadway clearing.

(6) Use straw bales, silt fences, mulching, or other favorable practices on disturbed soils on unstable cuts, fills, etc.

(7) Avoid constructing new roads in SMZs, to the extent practicable.

D. Road Management

(1) Avoid using roads, where possible, for timber hauling or heavy traffic during wet periods on roads not designed and constructed for these conditions.

(2) Evaluate the future need for a road and close roads that will not be needed. Leave closed roads and drainage channels in a stable condition to withstand storms.

(3) Remove drainage crossings and culverts if there is a reasonable risk of plugging or failure from lack of maintenance.

(4) Following completion of harvesting, close and stabilize temporary spur roads and seasonal roads to control and direct water away from the roadway. Remove all temporary stream crossings.

(5) Inspect roads to determine the need for structural maintenance. Conduct maintenance practices, when conditions warrant, including cleaning and replacement of deteriorated structures and erosion controls, grading or seeding of road surfaces, and, in extreme cases, slope stabilization or removal of road fills, where necessary to maintain structural integrity.

(6) Conduct maintenance activities, such as dust abatement, so that chemical contaminants or pollutants are not introduced into surface waters, to the extent practicable.

(7) Properly maintain permanent stream crossings and associated fills and approaches to reduce the likelihood that
(a) stream overflow will divert onto roads, and
(b) fill erosion will occur if the drainage structures become obstructed.

E. Timber Harvesting

The timber harvesting management measure consists of implementing the following:

(1) Timber harvesting operations with skid trails or cable yarding follow layouts determined under Management Measure A.

(2) Install landing drainage structures to avoid sedimentation, to the extent practicable. Disperse landing drainage over sideslopes.

(3) Construct landings away from steep slopes and reduce the likelihood of fill slope failures. Protect landing surfaces used during wet periods. Locate landings outside of SMZs. Minimize size of landing areas.

(4) Protect stream channels and significant ephemeral drainages from logging debris and slash material.

(5) Use appropriate areas for petroleum storage, draining, and dispensing. Establish procedures to contain and treat spills. Recycle or properly dispose of all waste materials in accordance with State law.

For cable yarding:

(1) Limit yarding corridor gouge or soil plowing by properly locating cable yarding landings.

(2) Locate corridors for SMZs following Management Measure B.

(3) Cable yarding should not be done across perennial or intermittent streams, except at improved stream crossings.

For groundskidding:

(1) Within SMZs, operate groundskidding equipment only at stream crossings, to the extent practicable. In SMZs, fell and endline trees to avoid sedimentation.
(2) Use improved stream crossings for skid trails which cross flowing drainages. Construct skid trails to disperse runoff and with adequate drainage structures.
(3) On steep slopes, use cable systems rather than groundskidding where groundskidding may cause excessive sedimentation.
(4) Groundskidding should not be done across perennial or intermittent streams, except at improved stream crossings.

F. Site Preparation and Forest Regeneration Management Measure

Confine on-site potential nonpoint source pollution and erosion resulting from site preparation and the regeneration of forest stands. The components of the management measure for site preparation and regeneration are:

(1) Select a method of site preparation and regeneration suitable for the site conditions.
(2) Conduct mechanical tree planting and ground-disturbing site preparation activities on the contour of erodible terrain.
(3) Do not conduct mechanical site preparation and mechanical tree planting in SMZs.
(4) Protect surface waters from logging debris and slash material.
(5) Suspend operations during wet periods if equipment used begins to cause excessive soil disturbance that will increase erosion.
(6) Locate windrows at a safe distance from drainages and SMZs to control movement of the material during high runoff conditions.
(7) Conduct bedding operations in high water-table areas during dry periods of the year. Conduct bedding in erodible areas on the contour.
(8) Protect small ephemeral drainages when conducting mechanical tree planting.

G. Fire Management

Prescribe fire or suppress wildfire in a manner that reduces potential nonpoint source pollution of surface waters:

(1) Prescribed fire should not cause excessive sedimentation due to the combined effect of removal of canopy species and the loss of soil-binding ability of subcanopy and herbaceous vegetation roots, especially in SMZs, in streamside vegetation for small ephemeral drainages, or on very steep slopes.
(2) Prescriptions for fire should protect against excessive erosion or sedimentation, to the extent practicable.

(3) All bladed firelines, for prescribed fire and wildfire, should be plowed on contour or stabilized with water bars and/or other appropriate techniques if needed to control excessive sedimentation or erosion of the fireline.

(4) Wildfire suppression and rehabilitation should consider possible nonpoint source pollution of watercourses, while recognizing the safety and operational priorities of fighting wildfires.

H. Revegetation of Disturbed Areas

Reduce erosion and sedimentation by rapid revegetation of areas disturbed by harvesting operations or road construction:

(1) Revegetate disturbed areas (using seeding or planting) promptly after completion of the earth-disturbing activity. Local growing conditions will dictate the timing for establishment of vegetative cover.

(2) Use mixes of species and treatments developed and tailored for successful vegetation establishment for the region or area.

(3) Concentrate revegetation efforts initially on priority areas such as disturbed areas in SMZs or the steepest areas of disturbance near drainages.

I. Forest Chemical Management

Use chemicals when necessary for forest management in accordance with the following to reduce nonpoint source pollution impacts due to the movement of forest chemicals off-site during and after application:

(1) Conduct applications by skilled and, where required, licensed applicators according to the registered use, with special consideration given to impacts to nearby surface and ground waters.

(2) Carefully prescribe the type and amount of pesticides appropriate for the insect, fungus, or herbaceous species.

(3) Establish and identify buffer areas for surface waters. (This is especially important for aerial applications.)

(4) Prior to applications of pesticides and fertilizers, inspect the mixing and loading process and the calibration of equipment, and identify the appropriate weather conditions, the spray area, and buffer areas for surface waters.

(5) Immediately report accidental spills of pesticides or fertilizers into surface waters to the appropriate State agency. Develop an effective spill contingency plan to contain spills.

J. Wetlands Forest Management

Plan, operate, and manage normal, ongoing forestry activities (including harvesting, road design and construction, site preparation and regeneration, and chemical management) to adequately protect the aquatic functions of forested wetlands.

Urban Areas

Urban Runoff:

A. New Development Management Measure

(1) By design or performance:

(a) After construction has been completed and the site is permanently stabilized, reduce the average annual total suspended solid (TSS) loadings by 80%. For the purposes of this measure, an 80% TSS reduction is to be determined on an average annual basis,[2] or

(b) Reduce the postdevelopment loadings of TSS so that the average annual TSS loadings are no greater than predevelopment loadings, and

(2) To the extent practicable, maintain postdevelopment peak runoff rate and average volume at levels that are similar to predevelopment levels.

Sound watershed management requires that both structural and nonstructural measures be employed to mitigate the adverse impacts of storm water. The nonstructural Watershed Protection and Site Development Management Measures can be effectively used in conjunction with the New Development Management Measure to reduce both the short-and long-term costs of meeting the treatment goals of this management measure.

B. Watershed Protection Management Measure
Develop a watershed protection program to:

(1) Avoid conversion, to the extent practicable, of areas that are particularly susceptible to erosion and sediment loss;

(2) Preserve areas that provide important water quality benefits and/or are necessary to maintain riparian and aquatic biota; and

(3) Site development, including roads, highways, and bridges, to protect to the extent practicable the natural integrity of waterbodies and natural drainage systems.

C. Site Development Management Measure
Plan, design, and develop sites to:

(1) Protect areas that provide important water quality benefits and/or are particularly susceptible to erosion and sediment loss;

(2) Limit increases of impervious areas, except where necessary;

(3) Limit land disturbance activities such as clearing and grading, and cut and fill to reduce erosion and sediment loss; and

(4) Limit disturbance of natural drainage features and vegetation.

Construction Activities:

A. Construction Site Erosion and Sediment Control Management Measure

(1) Reduce erosion and, to the extent practicable, retain sediment onsite during and after construction, and

2 Based on the average annual TSS loadings from all storms less than or equal to the 2-year/24-hour storm. TSS loadings from storms greater than the 2-year/24-hour storm are not expected to be included in the calculation of the average annual TSS loadings.

(2) Prior to land disturbance, prepare, and implement an approved erosion and sediment control plan or similar administrative document that contains erosion and sediment control provisions.

B. Construction Site Chemical Control Management Measure

(1) Limit application, generation, and migration of toxic substances;
(2) Ensure the proper storage and disposal of toxic materials; and
(3) Apply nutrients at rates necessary to establish and maintain vegetation without causing significant nutrient runoff to surface waters.

Existing Development:

A. Existing Development Management Measure

Develop and implement watershed management programs to reduce runoff pollutant concentrations and volumes from existing development:

(1) Identify priority local and/or regional watershed pollutant reduction opportunities, e.g., improvements to existing urban runoff control structures;
(2) Contain a schedule for implementing appropriate controls;
(3) Limit destruction of natural conveyance systems; and
(4) Where appropriate, preserve, enhance, or establish buffers along surface waterbodies and their tributaries.

Onsite Disposal Systems

A. New Onsite Disposal Systems Management Measure

(1) Ensure that new Onsite Disposal Systems (OSDS) are located, designed, installed, operated, inspected, and maintained to prevent the discharge of pollutants to the surface of the ground and to the extent practicable reduce the discharge of pollutants into ground waters that are closely hydrologically connected to surface waters.

Where necessary to meet these objectives:

(a) discourage the installation of garbage disposals to reduce hydraulic and nutrient loadings; and

(b) where low-volume plumbing fixtures have not been installed in new developments or redevelopments, reduce total hydraulic loadings to the OSDS by 25%.

Implement OSDS inspection schedules for preconstruction, construction, and postconstruction;

(2) Direct placement of OSDS away from unsuitable areas. Where OSDS placement away from unsuitable areas is not practicable, ensure that the OSDS is designed or sited at a density so as not to adversely affect surface waters or ground water that is closely hydrologically connected to surface water. Unsuitable areas include, but are not limited to, areas with poorly or excessively drained soils; areas with shallow water tables or areas with high seasonal water tables; areas overlaying fractured bedrock that drain directly to ground water; areas within floodplains; or areas where nutrient and/or

pathogen concentrations in the effluent cannot be sufficiently treated or reduced before the effluent reaches sensitive waterbodies;

(3) Establish protective setbacks from surface waters, wetlands, and floodplains for conventional as well as alternative OSDS. The lateral setbacks should be based on soil type, slope, hydrologic factors, and type of OSDS. Where uniform protective setbacks cannot be achieved, site development with OSDS so as not to adversely affect waterbodies and/or contribute to a public health nuisance;

(4) Establish protective separation distances between OSDS system components and groundwater, which is closely hydrologically connected to surface waters. The separation distances should be based on soil type, distance to ground water, hydrologic factors, and type of OSDS;

(5) Where conditions indicate that nitrogen-limited surface waters may be adversely affected by excess nitrogen loadings from ground water, require the installation of OSDS that reduce total nitrogen loadings by 50% to groundwater that is closely hydrologically connected to surface water.

B. Operating Onsite Disposal Systems Management Measure

(1) Establish and implement policies and systems to ensure that existing OSDS are operated and maintained to prevent the discharge of pollutants to the surface of the ground and to the extent practicable reduce the discharge of pollutants into groundwaters that are closely hydrologically connected to surface waters. Where necessary to meet these objectives, encourage the reduced use of garbage disposals, encourage the use of low-volume plumbing fixtures, and reduce total phosphorus loadings to the OSDS by 15% (if the use of low-level phosphate detergents has not been required or widely adopted by OSDS users). Establish and implement policies that require an OSDS to be repaired, replaced, or modified where the OSDS fails, or threatens or impairs surface waters;

(2) Inspect OSDS at a frequency adequate to ascertain whether OSDS are failing;

(3) Consider replacing or upgrading OSDS to treat influent so that total nitrogen loadings in the effluent are reduced by 50%. This provision applies only:

(a) where conditions indicate that nitrogen-limited surface waters may be adversely affected by significant groundwater nitrogen loadings from OSDS, and

(b) where nitrogen loadings from OSDS are delivered to groundwater that is closely hydrologically connected to surface water.

Pollution Prevention:

A. Pollution Prevention Management Measure

Implement pollution prevention and education programs to reduce nonpoint source pollutants generated from the following activities, where applicable:

(a) The improper storage, use, and disposal of household hazardous chemicals, including automobile fluids, pesticides, paints, solvents, etc.;

(b) Lawn and garden activities, including the application and disposal of lawn and garden care products, and the improper disposal of leaves and yard trimmings;
(c) Turf management on golf courses, parks, and recreational areas;
(d) Improper operation and maintenance of onsite disposal systems;
(e) Discharge of pollutants into storm drains including floatables, waste oil, and litter;
(f) Commercial activities including parking lots, gas stations, and other entities not under NPDES purview; and
(g) Improper disposal of pet excrement.

B. Golf Course Management Measure

(1) Develop and implement grading and site preparation plans to:
  (a) Design and install a combination of management and physical practices to settle solids and associated pollutants in runoff from heavy rains and/or from wind;
  (b) Prevent erosion and retain sediment, to the extent practicable, onsite during and after construction;
  (c) Protect areas that provide important water quality benefits and/or are environmentally-sensitive ecosystems;
  (d) Avoid construction, to the extent practicable, in areas that are susceptible to erosion and sediment loss;
  (e) Protect the natural integrity of waterbodies and natural drainage systems by establishing streamside buffers; and
  (f) Follow, to the extent practicable, the amended U.S. Golfing Association (USGA) guidelines for the construction of greens.
(2) Develop nutrient management guidelines appropriate to Hawaii for qualified superintendents to implement so that nutrients are applied at rates necessary to establish and maintain vegetation without causing leaching into ground and surface waters.
(3) Develop and implement an integrated pest management plan. Follow EPA guidelines for the proper storage and disposal of pesticides.
(4) Develop and implement irrigation management practices to match the water needs of the turf.

Roads, Highways, and Bridges

A. Management Measure for Planning, Siting, and Developing Roads and Highways
Plan, site, and develop roads and highways to:
  (1) Protect areas that provide important water quality benefits or are particularly susceptible to erosion or sediment loss;
  (2) Limit land disturbance such as clearing, grading and cut and fill to reduce erosion and sediment loss; and
  (3) Limit disturbance of natural drainage features and vegetation.

B. Management Measure for Bridges

Site, design, and maintain bridge structures so that sensitive and valuable aquatic ecosystems and areas providing important water quality benefits are protected from adverse effects.

C. Management Measure for Construction Projects
   (1) Reduce erosion and, to the extent practicable, retain sediment onsite during and after construction and
   (2) Prior to land disturbance, prepare and implement an approved erosion control plan or similar administrative document that contains erosion and sediment control provisions.

D. Management Measure for Construction Site Chemical Control
   (1) Limit the application, generation, and migration of toxic substances;
   (2) Ensure the proper storage and disposal of toxic materials; and
   (3) Apply nutrients at rates necessary to establish and maintain vegetation without causing significant nutrient runoff to surface water.

E. Management Measure for Operation and Maintenance

Incorporate pollution prevention procedures into the operation and maintenance of roads, highways, and bridges to reduce pollutant loadings to surface waters.

F. Management Measure for Road, Highway, and Bridge Runoff Systems
Develop and implement runoff management systems for existing roads, highways, and bridges to reduce runoff pollutant concentrations and volumes entering surface waters.
   (1) Identify priority and watershed pollutant reduction opportunities (e.g., improvements to existing urban runoff control structures); and
   (2) Establish schedules for implementing appropriate controls.

Marinas and Recreational Boating

Siting and Design:

A. Marina Flushing Management Measure
Site and design marinas such that tides and/or currents will aid in flushing of the site or renew its water regularly.

B. Water Quality Assessment Management Measure
Assess water quality as part of marina siting and design.

C. Habitat Assessment Management Measure
Site and design marinas to protect against adverse effects on coral reefs, shellfish resources, wetlands, submerged aquatic vegetation, or other important riparian and aquatic habitat areas as designated by local, State, or federal governments.

D. Shoreline Stabilization Management Measure
Where shoreline erosion is a serious nonpoint source pollution problem, shorelines may need to be stabilized. Vegetative methods are strongly preferred. Structural methods may be necessary where vegetative methods cannot work and where they do not interfere with natural beach processes or harm other sensitive ecological areas.

E. Storm Water Runoff Management Measure
Implement effective runoff control strategies which include the use of pollution prevention activities and the proper design of hull maintenance areas.

Reduce the average annual loadings of total suspended solids (TSS) in runoff from hull maintenance areas by 80%. For the purposes of this measure, an 80% reduction of TSS is to be determined on an average annual basis.

F. Fueling Station Design Management Measure
Design fueling stations to allow for ease in cleanup of spills.

G. Sewage Facility Management Measure
Install pumpout, dump station, and restroom facilities where needed at new and expanding marinas to reduce the release of sewage into surface waters. Design these facilities to allow ease of access and post signage to promote use by the boating public.

Marina and Boat Operation and Maintenance:

A. Solid Waste Management Measure
Properly dispose of solid wastes produced by the operation, cleaning, maintenance, and repair of boats to limit entry of solid wastes into surface waters.

B. Fish Waste Management Measure
Promote sound fish waste management through a combination of fish-cleaning restrictions, public education, and proper disposal of fish waste.

C. Liquid Material Management Measure
Provide and maintain appropriate storage, transfer, containment, and disposal facilities for liquid material, such as oil, harmful solvents, antifreeze, and paints, and encourage recycling of these materials.

D. Petroleum Control Management Measure
Reduce the amount of fuel and oil from boat bilges and fuel tank air vents entering marina and surface waters.

E. Boat Cleaning Management Measure

For boats that are in the water, perform cleaning operations to minimize, to the extent practicable, the release to surface waters of harmful cleaners, solvents, and paint from in-water hull cleaning.

F. Public Education Management Measure
Public education/outreach/training programs should be instituted for boaters, as well as marina owners and operators, to prevent improper disposal of polluting material.

G. Maintenance of Sewage Facilities Management Measure
Ensure that sewage pumpout facilities are maintained in operational condition and encourage their use.

H. Boat Operation Management Measure (applies to boating only)
Restrict boating activities where necessary to decrease turbidity and physical destruction of shallow-water habitat.

Hydromodifications

Channelization and Channel Modifications

A. Management Measure for Physical and Chemical Characteristics of Surface Waters
(1) Evaluate the potential effects of proposed channelization and channel modification on the physical and chemical characteristics of surface waters in coastal areas;
(2) Plan and design channelization and channel modification to reduce undesirable impacts; and
(3) Develop an operation and maintenance program for existing modified channels that includes identification and implementation of opportunities to improve physical and chemical characteristics of surface waters in those channels.

B. Instream and Riparian Habitat Restoration Management Measure
(1) Evaluate the potential effects of proposed channelization and channel modification on instream and riparian habitat in coastal areas;
(2) Plan and design channelization and channel modification to reduce undesirable impacts; and
(3) Develop an operation and maintenance program with specific timetables for existing modified channels that includes identification of opportunities to restore instream and riparian habitat in those channels.

Dams Management Measures:

A. Management Measure for Erosion and Sediment Control
(1) Reduce erosion and, to the extent practicable, retain sediment onsite during and after construction, and
(2) Prior to land disturbance, prepare and implement an approved erosion and sediment control plan or similar administrative document that contains erosion and sediment control provisions.

B. Management Measure for Chemical and Pollutant Control
   (1) Limit application, generation, and migration of toxic substances;
   (2) Ensure the proper storage and disposal of toxic materials; and,
   (3) Apply nutrients at rates necessary to establish and maintain vegetation without causing significant nutrient runoff to surface waters.

C. Management Measure for Protection of Surface Water Quality and Instream and Riparian Habitat
   Develop and implement a program to manage the operation of dams in coastal areas that includes an assessment of:
   (1) Surface water quality and instream and riparian habitat and potential for improvement and
   (2) Significant nonpoint source pollution problems that result from excessive surface water withdrawals.

Streambank and Shoreline Erosion Management Measure:

A. Management Measure for Eroding Streambanks and Shorelines
   (1) Where streambank or shoreline erosion is a serious nonpoint source pollution problem, streambanks and shorelines may need to be stabilized. Vegetative methods are strongly preferred. Structural methods may be necessary where vegetative methods cannot work and where they do not interfere with natural beach processes or harm other sensitive ecological areas.
   (2) Protect streambank and shoreline features with the potential to reduce nonpoint source pollution.
   (3) Protect streambanks and shorelines from erosion due to uses of either the shorelands or adjacent surface waters.
   (4) Where artificial fill is eroding into adjacent streams or coastal waters, it should be removed.

Wetlands, Riparian Areas, and Vegetated Treatment Systems

A. Management Measure for Protection of Wetlands and Riparian Areas
   Protect from adverse effects wetlands and riparian areas that are serving a significant nonpoint source pollution abatement function and maintain this function while protecting the other existing functions of these wetlands and riparian areas as measured by characteristics such as vegetative composition and cover, hydrology of surface water and ground water, geochemistry of the substrate, and species composition.

B. Management Measure for Restoration of Wetland and Riparian Areas
   Promote the restoration of the pre-existing functions in damaged and destroyed wetlands and riparian systems in areas where the systems will serve a significant nonpoint source pollution abatement function.

C. Management Measure for Vegetated Treatment Systems

Promote the use of engineered vegetated treatment systems such as constructed wetlands or vegetated filter strips where these systems will serve a significant nonpoint source pollution abatement function.

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